**Wednesday Conference Meeting 03/30/11**

* Working on plant layout (using google 3-D)
  + google sketchUp
  + can use plot plan 2-D...no need for 3-D
  + also using Visio
* Working on finishing up economics
* PFD is in Visio format
  + post screenshot to make it seen for all

**Tuesday Conference Meeting 03/15/11**

* What is important for process to operate properly
* Need schematic of necessary controls in place
* ISA symbology
* Distillation column- temp, composition, temp change, over head receiver, not dry pump, must have some level in the bottom of the columns, platform wert twenty or thirty feet, platform with ladder
* Hx- must be able to pull tubes, need space for this, orient hot dog style,
* control room, locker room, storage tanks, all equipment must be located, must have access space between equipment

**Notes taken during Meeting 3**

Engineering challenges Use block flow in presentation In Econ, total cost total profit, not all components Spec on period of investment Cost of money that every group will use Interest cost of money Every group will be using the same assumptions Removing gas, there is am adsorption and stripping process Hotel used engineering world for costs or sizing? Must remember to number slides Paired groups do economics together Look into what to do with waste, thermal oxidizer? Adiabatic flash to size heater

**Wednesday 03/09/11 Telecom Meeting**

1. Presented more info than expected, good!
2. Next week, March 14-18, 2011: need to meet with Shannon possibly Tuesday but she’ll email us

So that we can work on:

* + 1. Finalizing PFD
    2. Finalizing Material balance
    3. Preparing proper layout of process
    4. And sizing

1. Need to know flash conditions
2. The new reactor conditions for 1st and 2nd reactors need to be defined
   1. If there’s a temperature rise, state
   2. Address how to get heat out of there
3. Crystallization: it’s a point below saturation
4. there was water in 2nd reaction but need to state
5. search more on cobalt iodide
   1. price
   2. solubility in water, propionaldehyde and propionic acid

**Tuesday 03/08/11 Questions and suggestions made by Mentors:**

Presentation questions:

* sizing of the distillation column are usually ~85 ft for a 35 theoretical stages
* Aldehyde: vapor & flashed
* HX between reactor & flash?
* Streams 4 & 7 should be same temperature
* Bubbling gas through tank, spark O2 to it
* Separation of propionic acid from water, how soluable is it in water?
* Are we crystallizing or precipitation it out of the process?
* Put water on Co catalyst…it will need water make-up stream

**Wednesday 02/23/11 Telecom Meeting**

* We need more details especially on economics in order to increase grade on presentation
* We have more info on nickel carbonyl and it shows up in ASPEN as a gas phase only which is causing a problem because literature says it’s been in liquid form
* Method of recovering our catalyst (cobalt halide)? We’re getting high reflux ratio
* Ask Prof. Nitche on ASPEN
* CSTR deals with liquids but our design is not a CSTR, can use for place holder, think about using PFR…
* Use dielstein…orgo synthesis
* Look at patents for using catalysts
* Post correction on Wiki of specs
* What manufacturers use our catalyst?
* If it’s only one stream we’ll have to keep buying new, if we know price and what we need, we can get by with this
* Use ASPEN for equipment sizing but not all of them
* We need details on one of the operations in terms of sizing, looking at one area and making sure we have everything we need, look at it more closely and make sure everything is checked
* Energy sinks, look at where energy is coming from and into deltaH across a reactor
* We will have to see the design and sizing of reactor which ASPEN does not recognize

**Thursday 02/17/11 Telecom Meeting**

* Write abstract by Monday 02/21 as it is due then
* 5-6 page progress summary is due on midterm day, week 8
* Email CoX manufacturers to get conversion rates and other important information
* Integrate catalyst into Aspen
* Look into catalyst interaction and recovery
* MSDS sheets for more safety information
* Fix economics, no more place holders
* Use knovel in research
* Divide utilities cost with Foxtrot
* Reactor information, CSTR implies liquid
* Pumps compress liquids and Compressors compress gasses
* Find out about Drew’s catalyst
* Prove that separation is occurring in all separators
* Heat of compression
* Reciprocating compressors don’t go above 250 °F use multistage

**Tuesday 02/15/11 Questions and suggestions made by Mentors:**

* Note the sources of the info and numbers brought up
* Note the $/yr or day or month that are being calculated in the pricing and economics
* Use scientific notation, commas, an overall number to describe an estimate without many and ongoing significant figures
* Price of syngas is high...get a better estimate
* Estimated capital cost is very low, get a better estimate
* There are equipment/steps needed in the process such as: decanter, recycle, to recover catalyst on regular basis
* something to make sure catalyst doesn't go anywhere wrong
* heat removal step
* where to flash out product
* CSTR is a design reactor or are we modeling it like that in aspen?
* show what it is/what it's like
* How do we get aldehyde out of liquid?
* stick with outline as placed in beginning of presentation
* include capital cost in a safety system
* place process overview with total #s in and out, this can be displayed in a diagram
* improvise the block flow diagram to show what's in the streams and display numbers

**Meeting with our mentor**

* Do we need refrigerant at recycle stream? When reaction is happening at high temperature. Show her price of refrigerant and if ok to use.
  + Depending on where we are letting out to…not necessary
* How much refrigerant/cooling water we need?
  + How much heat is generated should tell us how much cooling water we need
* How much catalyst we need? How to find that?
* How long for 1st and 2nd…may not need large volume. How long we need to be in, residence time. Ask Dennis/Bill
* Find reactivity and selectivity
  + Do we need cooling tower?
  + Sharing with other grp their cooling tower.
  + Look into air coolers
  + Look into heat effluent exchange
* Cobalt propionate or cobalt halide which to choose?
* How to include catalyst in aspen?
* Have you contacted Adam Kenya about the Sulfur concentration of syngas from foxtrot?
  + She talked to him but Adam will talk to foxtrot so that they find a solution for it.
* Specifics on utility costs? What do we include?
  + Add into the ppt
* Use multiple stage compressors with ethylene
* More hydrocarbons are stored in spheres
* Vapor pressure will be high for ethylene

Things to add to the power point:

* Add a row for temps and pressures for each stream number
* Enthalpy can be found from aspen in the stream summary, use those, they’re fine. If we don’t want to use, address that we don’t and state how we’ll find it.
* Change 30kt/yr to English units
* Fix environmental review=add nickel carbonyl
* Nickel Carbonyl: OSHA has permissible exposure: 0.001ppm for gen industry, threshold limit is 0.05ppm, grp1 human carcinogen.
* Cobalt Iodide: OSHA 0.1 cob/m3 (rate 3-reacts explosively with water)
* Fix block flow diagram update according to aspen-kevin
* Update competing process slide (we are doing 1st rxn but we’re not doing 2nd)
* Fix graphs, sharpen view
* Cheaper to transport coal than ethylene-slide “plant location” fix it
* Interest on loans we’re getting to build…we have negative cash flow initially?
* How long will it take to build the plant?
* Delete 3rd point on slide: estimates
* Slide: catalyst of nickel carbonyl change unit to English
* Plant Standards EPA, ASME (for pipe standards), OSHA, and FDA: find out product purities, to be generally recognized as a safe list,
* Price graph: need a current date
* MB in hand calc
* Catalyst life? Nickel bought every yr but cobalt, include the cost as an initial cost as well as annual
* Selectivity of catalyst?
* Recovery of catalyst? Flash, not sure if we’re getting 100%
* We r reacting in gas phase in 1st reactor

**Thursday, February 10, 2011, Conference call**

* what we are working on:
* Material and Energy Balances
* Aspen flowsheet
* Aspen Material Balance
* Hand calculations
* Economics
* pricing on catalysts
* Cobalt (II) Iodide
* Nickel Carbonyl
* Utility costs
* Plant Economics
* List of things to look over again:
* Flow sheet with flag streams
* MB & EB around multiple pieces of equipment in a table
* State how this process is going to close
* Need units from lb/yr to lb/hr
* Pay attention to significant figures
* State the hrs/yr the plant will run
* Number all streams on flow sheet
* Look further into:
* What is the syngas coming out at (T & P)?
* Run Economic Analysis
* Size compressors with knowing what's coming in
* Multiple stages for compressor

**Thursday February 3, 2011, Conference call**

* What we are working on:
  + economic evaluation
  + carbon or stainless steel?
  + over 800 F cant use carbon
  + material and energy balance
  + have an in-progress aspen flowsheet for material balances
  + will start on energy balances soon
* Location: Morris, Il
  + make sure its close to a railroad so its easy for foxtrot to transport coal.
  + Send flowsheet to Shannon when done
* Next conference call: Thursday, February 10th at 1:00 pm
* Discuss time for in person meeting with Shannon
* On the table:
  + Get to Shannon's work after senior design
  + Friday evenings after 4

**Friday January 28, 2011**

Joint Team Meeting: Foxtrot and Echo.

Shannon Brown, Adam Kanyuh

* Purpose of the meeting:
  + Things seem in "flux"
  + Establish a feed basis (should be given to team Foxtrot by Monday)
* What we need to do:
  + Send an email to Foxtrot, Shannon and Adam stating the composition and the feed rate required
  + what contaminants can we ignore?
  + what will poison our catalyst?
  + what exactly are our requirements?
  + Location?? (information needs to be handed over to Foxtrot sometime next week.)
  + ﻿its easier to transfer coal compared to transferring ethylene, so this decision should be made as a joint group.
  + some locations to look into:
  + st. louis (marathon petrochemical plants)
  + do they sell ethylene crackers?
  + gulf coast
  + look up where ethylene crackers are readily available
  + send a few locations to foxtrot so they have a choice as well
  + Utility conditions?
  + Are there any conditions that both the teams need?
  + compare conditions with foxtrot and determine if there is anything we both can use
  + example: steam pressure levels
* What we know:
  + Echo needs syngas to be at these ranges:
  + temp: 250-300 C
  + pressure: 100-300 bar
  + Echo is using nickel carbonyl and cobalt as catalysts
  + Foxtrot currently want their gassifier to be located in Illinois # 6 Basin/Butiminous
  + located in southern illinois

**Notes from first meeting with Shannon (Jan 23, 2011) meeting:**

* Spec of impurities to gasifier team
* How pure is the feed stock?
* What would poison the catalyst
* Produce 80 kilotonne/year? Share of world market?
* Outline of what we are covering – week by week
* On powerpoint
* Look at schedule
* Focus of the week
* Economic analysis of buying vs. making ethylene
* Add quantity to design basis
* Check up solid support for catalyst
* Autoclave? Does it dissolve better?
* Acyl rhodium tetra carbonyl
* Lowers temp to 45 C
* Ceramic catalyst- talk to Meyers
* State of catalyst?
* Rough economics – meeting two
* Set up report on wiki
* More on environment review after catalyst

**Meeting: January 20, 2011**

Working Title: Synthesis of Plastics from Propionic Acid

Design Basis: Why we need to produce plastic. (In Discussion)

Plastics being looked at:

* Polyethylene
  + Polyethylene (or polyethene, polythene, PE) is a [family](http://www.ehow.com/relationships-and-family/) of materials categorized according to their density and molecular structure. For example, ultra-high molecular weight polyethylene (UHMWPE) is tough and resistant to chemicals, and it is used to manufacture moving machine parts, bearings, gears, artificial joints and some bulletproof vests. High-density polyethylene (HDPE) is used to make milk jugs, margarine tubs and water pipes. Medium-density polyethylene (MDPE) is used for packaging film, sacks and gas pipes and fittings. Low-density polyethylene (LDPE) is soft and flexible and is used in the manufacture of squeeze bottles, sacks and sheets.
  + Read more: [Uses of Thermoplastics | eHow.com](http://www.ehow.com/about_5436147_uses-thermoplastics.html#ixzz1BcBHf3eN) <http://www.ehow.com/about_5436147_uses-thermoplastics.html#ixzz1BcBHf3eN>
* Teflon
  + Teflon is the brand name given by DuPont Corp. for a polymer called polytetrafluoroethylene (PTFE), which belongs to a class of thermoplastics known as fluoropolymers. It is famous as a coating for non-stick cookware. Being chemically inert, it is used in making containers and pipes that come in contact with reactive chemicals. It is also used as a lubricant to reduce wear from friction between sliding parts, such as gears, bearings and bushings.
* Read more: [Uses of Thermoplastics | eHow.com](http://www.ehow.com/about_5436147_uses-thermoplastics.html#ixzz1BcBarTNg) <http://www.ehow.com/about_5436147_uses-thermoplastics.html#ixzz1BcBarTNg>
* *Leaning towards making propionic acid -> polyethylene*

**Wednesday January 19, 2011 (first meeting as a group)**

* Do some research by second group meeting
* Advantages and Disadvantages of gasses being looked into:
* Propionic acid:
  + Naturally occurring
  + Made from ethylene and carbon monoxide
  + Uses and advantages:
  + Analgesic
  + Intermediate product for thermoplastic
* Formic acid:
  + May cause damage to optic nerves
  + Made from methanol, ammonia sulfuric acid, and carbon monoxide
  + Also made from water and carbon monoxide
  + Cheapest to make?
  + Operating at a high partial pressure
  + Simplest carboxylic acid
* Acetic acid:
  + Global demand: 6.5million tonnes/year
  + Made from carbon monoxide and methanol